

Natural Apospory in Pteridium?

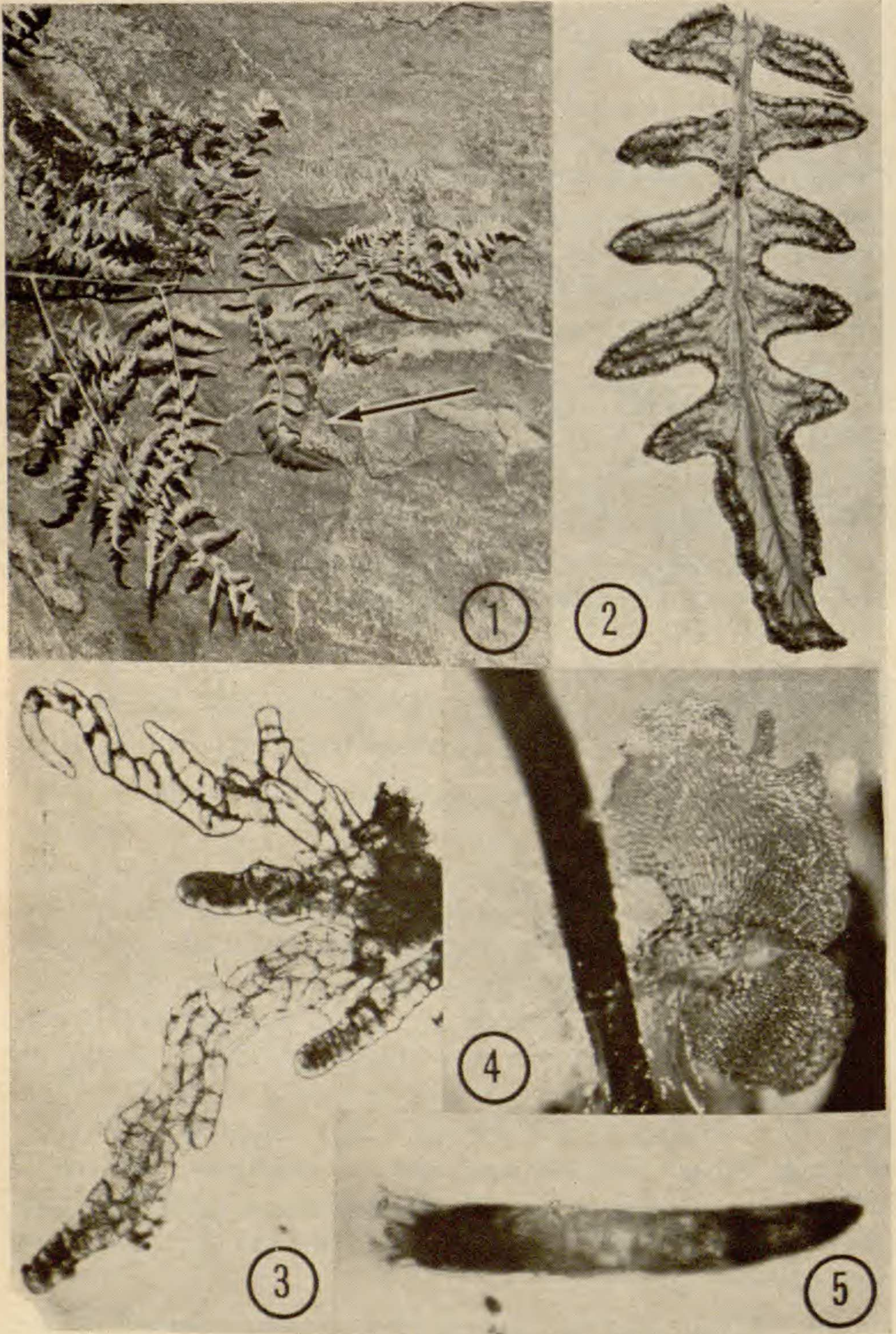
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From a population of the bracken fern in New Hampshire, Farlow (1889) described prothalloid outgrowths from the marginal sori. He concluded that natural apospory, i.e. the formation of a gametophyte vegetatively from a sporophyte under normal environmental conditions, had occurred as reported by Druery (1884) and Bower (1884). Steil (1949) studied prothalloid outgrowths on *Pteridium* leaves from Wisconsin. He reported that these outgrowths never produced rhizoids or sex organs nor became cordate under natural or experimental conditions. Since gametophytic characters were absent, Steil concluded that the outgrowths were not aposporous gametophytes.

In recent years I have studied this abnormality of the leaves of *Pteridium aquilinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw. ex Heller from three localities in Massachusetts: Boston, Lincoln, and Millbury. At Millbury observations were made for eight years and a specimen from this locality has been deposited in the Vanderbilt University Herbarium, VDB 38094.

This abnormality produces morphological modifications of the *Pteridium* leaf. The leaf is more dissected and the ultimate segments are narrower and somewhat twisted (*Fig. 1*). The abnormality may be on only a few leaves of a rhizome and may affect a part of a leaf (*Fig. 1*), but it occurs in the same population in successive years. The abnormal leaf bears prothalloid-like outgrowths which appear as a green mass protruding from under the revolute margin of the leaf (*Fig. 2*). These proliferations (*Fig. 3*) arise from the receptacle of the *Pteridium* sorus. The outgrowths are sporangia in various stages of abortion and other proliferations without sporangial characters. Occasionally, normal sporangia develop along with these outgrowths. The outgrowths are never cordate and do not bear sex organs or rhizoids.

Marginal pieces of the abnormal leaves were cultured on the agar surface of an inorganic nutrient medium (Whittier &



PTERIDIUM AQUILINUM VAR. *LATIUSCULUM*

Steeves, 1960). The outgrowths increased in size but did not become cordate prothalli with sex organs and rhizoids. Bell & Richards (1958) reported a moist agar surface is conducive for induced apospory, i.e. the formation of a gametophyte vegetatively from a sporophyte under experimental conditions. Juvenile leaves of *Pteridium* isolated from the sporophyte and laid on the agar surface produced aposporous gametophytes (Fig. 4). If the outgrowths on the abnormal *Pteridium* leaves are aposporous gametophytes, gametophytic characters should develop under the conditions which induce apospory. Rarely, cordate prothalli did form from the marginal leaf pieces, but these were due to spores from the occasional sporangia among the prothalloid-like outgrowths.

Farlow (1889) raised the possibility of a dry summer causing these outgrowths. However, at the locality observed for eight years the abnormality occurred in wet and dry years and also it was recognized on immature leaves early in the spring. Steil (1949) suggested that some physiological or pathological factor caused the abnormality. With the cause of the outgrowths undetermined, an earlier report of a "parasitic dimorphism" of *Pteridium* leaves in France by Molliard (1898) was considered. He reported a leaf gall on *Pteridium* which was similar to the descriptions of the *Pteridium* abnormality by Farlow (1889) and Steil (1949). In Molliard's case the leaf gall was caused by a mite which he described and named *Phytoptus pteridis*; it is listed by Nalepa (1928) as *Eriophyes pteridis* (Moll.).

Pteridium leaves from the Massachusetts localities had mites only on abnormal leaves or abnormal portions of leaves. The

FIGURES 1—5. FIG. 1. TERMINAL PINNAE OF AN ABNORMAL PTERIDIUM LEAF. ARROW DENOTES PART OF ONE PINNA WITH NORMAL DEVELOPMENT, \times 0.4. FIG. 2. PINNULE WITH PROTHALLOID-LIKE OUTGROWTHS GROWING FROM UNDER REVOLUTE MARGIN, \times 6. FIG. 3. PROTHALLOID-LIKE OUTGROWTHS ISOLATED FROM MARGIN, \times 100. FIG. 4. APOSPOROUS GAMETOPHYTE FROM THE PETIOLE OF A JUVENILE PTERIDIUM LEAF, \times 10. FIG. 5. ERIOPHYID MITE FROM UNDER REVOLUTE MARGIN OF LEAF, FIXED IN FAA, \times 150.

mites were beneath the revolute margins with the prothalloid-like outgrowths. In areas of heavy infestations the leaf margin turned brown and had a necrotic appearance. The small (about 0.4 mm long), translucent white mites could be observed moving over the outgrowths if the leaf margin was unrolled. Keifer (pers. comm., 1965) reports the mites from this leaf material belong to two species of the genus *Eriophyes*. Whether one is *E. pteridis* has not been resolved due to an inadequate original description, and the other species may be undescribed.

This study corroborates and extends the investigation of Steil (1949) by confirming the abnormality as a pathological condition, the outgrowths of the gall from the receptacle of the sorus being without gametophytic characters under normal and experimental conditions. Thus these outgrowths cannot represent natural apospory. I wish to thank Dr. H. H. Keifer, Bureau of Entomology, California Department of Agriculture, Sacramento, California, for identifying the mites from the abnormal *Pteridium* leaves.

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